MA 227, CALCULUS III

Spring, 2010

Name (Print last name first): .....

Student Signature: .....

TEST II

10 questions, 10 points each.
SHOW ALL YOUR WORK! CIRCLE YOUR ANSWER!

Question 1

Find the gradient of the function $f(x, y) = xe^{xy}$ at the point $(2, 0)$.

Question 2

Find the directional derivative of the function $f(x, y, z) = xz - xy$ in the direction of the vector $\vec{v} = \vec{i} - 2\vec{j} + 2\vec{k}$ at the point $(1, 2, 0)$.

Question 3

Find local maximum, minimum and saddle points (if any) of the function

$$f(x, y) = 2x^2 + 4xy - y^2 + 6x - 5.$$

Question 4

Let $z = x^3y^2 - \frac{x}{y}$. Find equation of the tangent plane at point $(2, 1)$.

Question 5

Find linear approximation for the function

$$f(x, y) = 2x^2 + y + yx$$

near point $(1, -2)$.

Question 6

Let $f(x,y) = xy - x^2y$ and $x = s - t, \quad y = s^2t$. Find partial derivatives $\frac{\partial f}{\partial s}$ and $\frac{\partial f}{\partial t}$.

Question 7

Let $f(x,y) = x^2y - xy^2$ and $x = t^2$, $y = 3t$. Find derivative $\frac{df}{dt}$.

Question 8

Find equation of the tangent plane to the surface $x^2 + 2y^2 - 3z^2 = 3$ at the point $(2, -1, 1)$.

Question 9

Find the maximum rate of change of $f(x, y) = x^2y + 2\sqrt{y}$ at the point $(2, 1)$. In which direction does it occur?

Question 10

Find the absolute maximum and absolute minimum of the function $f(x, y) = 2x^2+3y^2-4x-5$ on the region $0 \leq x \leq 2, \quad -1 \leq y \leq 1$. Be sure to provide coordinates of the points and the values of absolute maximum and minimum.